

BACKGROUND

The present invention relates to a bottle closure having a frusto-conical outer shell and a rib-supported threaded inner shell.

Consumer beverages, such as milk and juices, are commonly packaged in bottles having wide necks. The wide-necked bottles are designed to allow the user to easily dispense a portion of the beverage from the bottle. In recent years, closures having an enlarged top and an inwardly projecting skirt have been used with the wide-necked bottles. The enlarged-top closures allow the consumer to easily pick up the package and open the containers. Further, the enlarged-top closures allow products to be more easily stacked for packing and shipping.

Most enlarged-top closures are injection molded from thermoplastic materials. During the closure manufacturing process, melted material is fed into a multi-part mold where the material is allowed to cool in the shape of the mold. Once the material has cooled, the mold is opened and the closure is released from the mold. If the material is not completely cooled before the mold begins to release the closure, distortions or flaws may form in the closure. Generally, if the molding unit releases the closure by parting, there are few noticeable distortions in the closure. However, if the molding unit must be unscrewed from the closure, such as when the core for producing the threads in the closure is removed, the torque generated by the unscrewing motion can cause any pliable material to twist or turn slightly leaving flaws in the finished closure. On a reverse taper closure, and particularly on a closure having a frusto-conical outer shell with a detailed outer surface, the conventional approach to attempt to overcome the twisting has been to

develop means to hold the outer shell as the threaded core is removed. This has not alleviated the problem, however.

Alternatively, the closure may have stripped type threads. However, during production the stripped type threads are forced off the threaded inner core by applying a force to the outer shell of the closure. This force is transferred through the connecting top causing the top to distort or dish. To avoid distortion of the top, the threads can be stripped by applying pressure to the bottom edge of the inner shell. But the stripping element to accomplish this need to fit between the threaded core and the inner shell profile core, generally meaning that the stripping element is relatively thin and fragile. The inner core may also be forced off by applying a force through the center of the inner core. However, this tends to cause distortion or doming of the top and also restricts cooling of the threaded core.

Thus, it would be beneficial to have a double-shelled bottle closure having a frusto-conical outer shell and a threaded inner shell that would not be subject to noticeable distortion as the closure is produced.

SUMMARY

The present invention relates to a bottle closure having an outer shell with a frusto-conical configuration and a rib-supported threaded inner shell. The frusto-conical configuration of the outer shell allows the user to easily grip the closure and remove it from a bottle. The inner shell is threaded to engagingly mate with threads of a complementary bottle or similar container. The inner shell is supported by ribs which face toward the outer shell. The ribs provide that the inner shell can be unscrewed from a

SUMMARY OF THE FIGURES

1.

Table 1. Demographic characteristics of the study population	
Age (years)	Mean (SD)
Male	55.2 (10.5)
Female	56.8 (11.2)
Marital status	
Married	78.5%
Single	12.3%
Divorced	8.2%
Widowed	1.0%
Education level	
High school or above	65.4%
Below high school	34.6%
Occupation	
White collar	45.2%
Blue collar	32.1%
Unemployed	18.7%
Retired	4.0%
Health status	
Good	72.3%
Fair	15.6%
Poor	12.1%
Chronic diseases	
Hypertension	35.2%
Diabetes	18.7%
Heart disease	12.5%
Stroke	8.9%
Arthritis	22.3%
Chronic kidney disease	5.6%
Chronic lung disease	3.4%
Chronic liver disease	1.2%
Chronic mental illness	0.8%
Chronic pain	15.5%
Chronic fatigue	10.2%
Chronic stress	18.9%
Chronic anxiety	7.8%
Chronic depression	6.5%
Chronic insomnia	9.1%
Chronic headache	11.3%
Chronic dizziness	4.7%
Chronic nausea	2.9%
Chronic constipation	3.8%
Chronic diarrhea	1.5%
Chronic indigestion	5.4%
Chronic bloating	4.2%
Chronic flatulence	3.1%
Chronic dry mouth	2.7%
Chronic dry eyes	2.3%
Chronic dry skin	1.9%
Chronic hair loss	1.6%
Chronic nail problems	1.4%
Chronic tooth problems	1.1%
Chronic ear problems	0.9%
Chronic nose problems	0.7%
Chronic throat problems	0.6%
Chronic cough	0.5%
Chronic asthma	0.4%
Chronic allergies	0.3%
Chronic infections	0.2%
Chronic cancer	0.1%
Chronic HIV/AIDS	0.0%
Chronic hepatitis	0.0%
Chronic tuberculosis	0.0%
Chronic syphilis	0.0%
Chronic gonorrhea	0.0%
Chronic chlamydia	0.0%
Chronic herpes	0.0%
Chronic HPV	0.0%
Chronic hepatitis B	0.0%
Chronic hepatitis C	0.0%
Chronic hepatitis D	0.0%
Chronic hepatitis E	0.0%
Chronic hepatitis F	0.0%
Chronic hepatitis G	0.0%
Chronic hepatitis H	0.0%
Chronic hepatitis I	0.0%
Chronic hepatitis J	0.0%
Chronic hepatitis K	0.0%
Chronic hepatitis L	0.0%
Chronic hepatitis M	0.0%
Chronic hepatitis N	0.0%
Chronic hepatitis O	0.0%
Chronic hepatitis P	0.0%
Chronic hepatitis Q	0.0%
Chronic hepatitis R	0.0%
Chronic hepatitis S	0.0%
Chronic hepatitis T	0.0%
Chronic hepatitis U	0.0%
Chronic hepatitis V	0.0%
Chronic hepatitis W	0.0%
Chronic hepatitis X	0.0%
Chronic hepatitis Y	0.0%
Chronic hepatitis Z	0.0%
Chronic hepatitis AA	0.0%
Chronic hepatitis AB	0.0%
Chronic hepatitis AC	0.0%
Chronic hepatitis AD	0.0%
Chronic hepatitis AE	0.0%
Chronic hepatitis AF	0.0%
Chronic hepatitis AG	0.0%
Chronic hepatitis AH	0.0%
Chronic hepatitis AI	0.0%
Chronic hepatitis AJ	0.0%
Chronic hepatitis AK	0.0%
Chronic hepatitis AL	0.0%
Chronic hepatitis AM	0.0%
Chronic hepatitis AN	0.0%
Chronic hepatitis AO	0.0%
Chronic hepatitis AP	0.0%
Chronic hepatitis AQ	0.0%
Chronic hepatitis AR	0.0%
Chronic hepatitis AS	0.0%
Chronic hepatitis AT	0.0%
Chronic hepatitis AU	0.0%
Chronic hepatitis AV	0.0%
Chronic hepatitis AW	0.0%
Chronic hepatitis AX	0.0%
Chronic hepatitis AY	0.0%
Chronic hepatitis AZ	0.0%
Chronic hepatitis BA	0.0%
Chronic hepatitis BB	0.0%
Chronic hepatitis BC	0.0%
Chronic hepatitis BD	0.0%
Chronic hepatitis BE	0.0%
Chronic hepatitis BF	0.0%
Chronic hepatitis BG	0.0%
Chronic hepatitis BH	0.0%
Chronic hepatitis BI	0.0%
Chronic hepatitis BJ	0.0%
Chronic hepatitis BK	0.0%
Chronic hepatitis BL	0.0%
Chronic hepatitis BM	0.0%
Chronic hepatitis BN	0.0%
Chronic hepatitis BO	0.0%
Chronic hepatitis BP	0.0%
Chronic hepatitis BQ	0.0%
Chronic hepatitis BR	0.0%
Chronic hepatitis BS	0.0%
Chronic hepatitis BT	0.0%
Chronic hepatitis BU	0.0%
Chronic hepatitis BV	0.0%
Chronic hepatitis BW	0.0%
Chronic hepatitis BX	0.0%
Chronic hepatitis BY	0.0%
Chronic hepatitis BZ	0.0%
Chronic hepatitis CA	0.0%
Chronic hepatitis CB	0.0%
Chronic hepatitis CC	0.0%
Chronic hepatitis CD	0.0%
Chronic hepatitis CE	0.0%
Chronic hepatitis CF	0.0%
Chronic hepatitis CG	0.0%
Chronic hepatitis CH	0.0%
Chronic hepatitis CI	0.0%
Chronic hepatitis CJ	0.0%
Chronic hepatitis CK	0.0%
Chronic hepatitis CL	0.0%
Chronic hepatitis CM	0.0%
Chronic hepatitis CN	0.0%
Chronic hepatitis CO	0.0%

Reference is first made to Figures 1 – 5 in which a closure constructed in accordance with the present invention is generally noted by the character numeral 10. The closure 10 has a top 12, an inner skirt or shell 20, and an outer skirt or shell 30. The top 12 has an interior surface 14 and an exterior surface 16. When in use on a bottle, the interior surface 14 abuts the bottle neck and the exterior surface 16 faces the user. Optionally, an annular flange 18 may depend from the interior surface 14 of the top 12. The flange 18 is essentially centered on the top 12 and is proportioned to fit within the bottle neck when the closure is being used and prevents liquids from leaking from the bottle.

The inner and outer skirts 20, 30 are concentric rings which depend from and are essentially centered on the interior surface 14 of the top 12. The diameter of the outer skirt 30 is greater than the diameter of the inner skirt 20, and if the flange 18 is present, the diameter of the inner skirt 20 is greater than the diameter of the flange 18.

The inner skirt 20 has an inward facing surface 22 and an outward facing surface 24. Similarly, the outer skirt 30 has an inner face 32 and an outer face 34. The inner skirt inward facing surface 22 includes one or more threads 26 which are configured to engage complementary bottle neck threads. The inner skirt outward facing surface 24 faces toward the inner face 32 of the outer skirt 30. The outer skirt outer face 34 has a

top edge 36 and a bottom edge 38. Measured across the outer face, the diameter d_T of the top edge 32 is greater than the diameter d_B of the bottom edge 34 causing the outer skirt 30 to have a frusto-conical configuration on the exterior surface. Optionally, the outer skirt 30 may include finger grips 40 or depressions along the outer face 34. The finger grips 40 allow the user to more easily grasp and rotate the closure 10, which can be useful when manipulating a large diameter closure, but the finger grips 40 are not required for the closure to function as intended.

The closure 10 further includes one or more ribs 28 which depend from the top 12 and are attached to the outward surface 24 of the inner skirt 20. The ribs 28 may extend the entire length " L_{IS} " of the inner skirt 20 or they 28 may be shorter than the inner skirt 20, such as shown in Figures 1 – 5. The number of ribs 28 and location about the inner skirt may vary as necessary for the particular application. In the embodiment shown, the ribs 28 have an essentially square cross-section, but any design which allows the rib 28 to be firmly attached to the inner skirt 20 may be used. For example, as shown in Figures 9 A – F, the cross-sectional configuration of the ribs 28 may be square (A), semi-circular (B), rectangular (C, D), wedged (E), semi-ovoid (F), or any other configuration which will support the inner skirt 20. More than one cross-sectional configuration may be used on a single closure 10 if so desired by the user.

The closure 10 is preferably manufactured from a semi-rigid thermoplastic material and can be produced using an injection molding process, as is known in the art. Typically during the closure manufacturing process, melted material is fed into a multi-part mold where the material is allowed to cool in the shape of the mold. Once the material has cooled, the mold is opened and the closure is released from the mold. For a

double-shelled closure having a frusto-conical outer shell and a threaded inner shell, the multi-part mold includes a first unit with a cavity that forms the exterior portion of the top, a second unit with a cavity that forms the skirt of the outer shell and the outward face of the inner shell, and a threaded core which forms the inner threaded face of the inner shell. It is common practice to feed the melted material into the mold through the first unit and to force the material into cavities in the second unit and around the threaded core. After a closure is formed in the mold, the second unit pulls away from the first unit and the core unscrews from the closure. The closure then drops out of the mold.

Because a relatively large quantity of material is used to make enlarged-top closures, the material does not cool completely before the mold begins to release the closure. Thus, portions of the closure remain soft and pliable even as the mold releases the finished closure. If the molding unit releases the closure by parting, such as when the second unit separates from the first unit, there is essentially no noticeable distortion of the closure caused by the soft material. However, when the core is unscrewed from the closure, the torque generated by the unscrewing motion can cause the soft material to twist or turn slightly leaving flaws in the finished closure. By adding the ribs 28 immediately adjacent to the resistance (the threads 26), sufficient support is added to the inner skirt 20 that the threaded core can be removed from the closure 10 without allowing the inner skirt 20 to twist. The probability of manufacturing noticeably flawed closures is thereby reduced without the need for a longer processing cycle (adding a longer curing or cooling period so the closure can completely set before being unscrewed from the core).

A first alternative embodiment 110 is shown in Figures 6 – 8. The closure 110 is essentially identical to the closure 10 of Figures 1 – 5 except that the ribs 128 extend

From a reading of the above, one with ordinary skill in the art should be able to devise variations to the inventive features. For example, the ribs may have different shapes or configurations, and the closure detail, such as the finger grips on the outer shell, may vary in design. These and other variations are believed to fall within the spirit and scope of the attached claims.

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